



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/870,243	05/30/2001	Robert L. Brainard	50540	8839

21874 7590 09/20/2004
EDWARDS & ANGELL, LLP
P.O. BOX 55874
BOSTON, MA 02205

EXAMINER
LEE, SIN J

ART UNIT PAPER NUMBER
1752

DATE MAILED: 09/20/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/870,243

Applicant(s)

BRAINARD ET AL.

Examiner

Sin J. Lee

Art Unit

1752

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07-21-2004 & 08-02-2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2 and 7-21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2 and 7-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

1. Applicants canceled claim 3.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 1, 2, 7-21 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 1 recites the limitation as to the concentration of photoacid generator being from 5.0 to 15.0 wt.%. Claim 8 recites the limitation as to the concentration of photoacid generator being from 5.0 to 12.0 wt.%. There is no support for these ranges (*applicants changed the number of significant figure without proper support in the original disclosure*).

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claim 20 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is very difficult to ascertain the meaning of present claim 20. For the purpose of examining the claim on the merit, the Examiner assumed that

applicants meant to say that the resin of claim 1 or 2 does not contain a polymer that contains acetal, ketal or ortho ester groups. Appropriate correction is required.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7. Claims 1, 7/1, 8/1, 11/1-15/1, and 19/1-21/1 are rejected under 35 U.S.C. 102(e) as being anticipated by Jung et al (6,391,518 B1).

In Example 14, Jung teaches a photoresist composition containing a polymer obtained from his Example 2 (10 g) and triphenylsulfonium trifluoromethanesulfonate (1.12 g which means that the photoacid generator is used in 10 wt% based on the weight of total solids), a photoacid generator which produces CF₃SO₃H (a perfluoroalkyl sulfonic acid) upon exposure. After coating the composition onto a silicon wafer, the coated wafer is exposed to light by using ArF laser exposing device and then developed to obtain a resist pattern. Jung *clearly states* in Example 14 that “[a]lternatively, KrF, E-beam, **EUV**, ion-beam, X-ray, VUV (vacuum ultraviolet) or ion beam may be used *instead of ArF* as a light source.” Based on this teaching, one of ordinary skill in the art would immediately envisage using EUV (since there are only a few alternatives) instead of ArF as a light source in Jung’s Example 14. Therefore, Jung teaches present

Art Unit: 1752

inventions of claims 1, 7, 8, 11, 13-15, 20 and 21 (*Jung's polymer made in his Example 2 does not contain acetal, ketal or ortho ester groups*).

With respect to present claim 12, Jung teaches (col.7, lines 15-21) that as his photoacid generator, *either* an onium type (such as triphenylsulfonium trifluoromethanesulfonate) *or* a sulfide type photoacid generator can be used. Based on this teaching, one of ordinary skill in the art would immediately envisage using a sulfide type photoacid generator (which is non-ionic) instead of triphenylsulfonium trifluoromethanesulfonate in Jung's Example 14. Therefore, Jung teaches present invention of claim 12.

With respect to present claim 19, in Example 15, Jung uses a polymer obtained from his Example 3, and the polymer of Example 3 contains acetal groups in the structure. Therefore, Jung also teaches present invention of claim 19.

8. Claims 1, 2, 7, 8, 11-20 are rejected under 35 U.S.C. 102(e) as being anticipated by Chen et al (6,103,447).

Chen teaches (col.1, lines 7-17, col.3, lines 3-12, lines 15-22) a positive tone chemically amplified resist system for use in mid-UV, deep-UV, **extreme UV**, X-ray, and e-beam lithography comprising (a) a polymer resin composition (a blend of at least two miscible aqueous base soluble polymer resins, one of which is partially protected with a high activation energy protecting group and the other of which is partially protected with a low activation energy protecting group), (b) acid generator, and (c) a solvent. As the polymer resin protected with a high activation energy protecting group, Chen teaches, for example in Example 5, a terpolymer of *hydroxystyrene*, *styrene*, and *tertiary butyl*

acrylate, and as the polymer resin protected with a low activation energy protecting group, Chen teaches methoxycyclohexane-protected polyhydroxystyrene polymer (*which has a ketal moiety*) in Example 5. Chen teaches (col.7, lines 10-14) that his chemically amplified resist system preferably comprises from about 0.005 to about 10 wt% of the acid generator. *Since 10 wt% is clearly disclosed in the reference as the higher limit of the range*, one of ordinary skill in the art would immediately envisage using 10 wt% of the acid generator in Chen's chemically amplified resist system.

Therefore, Chen teaches present range of 5.0-15.0 wt% (Chen also discloses the use of 5 wt% of photoacid generator in his Example 4). Although in Example 5, Chen exposes his resist film to DUV light, since Chen clearly states that his chemically amplified resist system is for use in mid-UV, deep-UV, **extreme UV**, X-ray, and e-beam lithography (and since there are only a few alternatives of light source), one of ordinary skill in the art would immediately envisage exposing Chen's resist coated on the silicon wafer to extreme UV. Therefore, the prior art teaches present inventions of claims 1, 2, 7, 8, 16-19.

With respect to present claims 11 and 13-15, Chen teaches (see Example 5) the use of di(t-butylphenyl)iodonium perfluorooctane sulfonate as one of the examples for his photoacid generator. Therefore, the prior art teaches present inventions of claims 11 and 13-15.

With respect to present claim 12, Chen teaches (col.6, lines 7 and 8) that nitrobenzyl compound (as well as onium salts, sulfonates, carboxylates) can also be used as his photoacid generator. Based on this teaching, one of ordinary skill in the art

would immediately envisage using nitrobenzyl compound as Chen's photoacid generator. Therefore, Chen teaches present invention of claim 12.

With respect to present claim 20, Chen teaches the equivalence of the ketal group and silylether group as the low activation energy protecting groups (see col.4, lines 53-58). Based on this teaching, one of ordinary skill in the art would immediately envisage using a silylether group-protected polyhydroxystyrene polymer as the polymer resin protected with a low activation energy protecting group instead of the methoxycyclohexane-protected polyhydroxystyrene polymer which is used in Chen's Example 5. Therefore, Chen teaches present invention of claim 20.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 9/1 and 10/1 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jung et al (6,391,518 B1).

As discussed above in Paragraph 7, in his Example 4, Jung uses 10 wt% of photoacid generator based on the weight of total solids. It is the Examiner's position that the amount of 10 wt% taught by Jung is close enough to the lower end of present range of *at least about 12 wt%* in claim 9 and to the lower end of present range of *11-15 wt%* in claim 10 that one skilled in the art would have expected them to have the same properties. Thus, the prior art's teaching of 10 wt% would render present ranges of

Art Unit: 1752

claims 9 and 10 *prima facie* obvious. Where the claimed ranges and prior art do not overlap but are close enough that one skilled in the art would have expected them to have the same properties, a *prima facie* case of obviousness would exist which may be overcome by a showing of unexpected results, In re Titanium Metals Corporation of America v. Banner, 227 USPQ 773 (Fed. Cir. 1985). Therefore, Jung's teaching would render obvious present inventions of claims 9 and 10.

11. Claims 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al (6,103,447).

As discussed above in Paragraph 8, Chen teaches the use of 10 wt% of photoacid generator. It is the Examiner's position that the amount of 10 wt% taught by Chen is close enough to the lower end of present range of *at least about 12 wt%* in claim 9 and to the lower end of present range of 11-15 wt% in claim 10 that one skilled in the art would have expected them to have the same properties. Thus, the prior art's teaching of 10 wt% would render present ranges of claims 9 and 10 *prima facie* obvious. Where the claimed ranges and prior art do not overlap but are close enough that one skilled in the art would have expected them to have the same properties, a *prima facie* case of obviousness would exist which may be overcome by a showing of unexpected results, In re Titanium Metals Corporation of America v. Banner, *supra*.

Therefore, Chen's teaching would render obvious present inventions of claims 9 and 10.

12. Claims 1, 2, 7, 8, 11-18, 20, and 21 are rejected under 35 U.S.C. 103(a) as being obvious over Barclay et al (6,492,086 B1).

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). For applications filed on or after November 29, 1999, this rejection might also be overcome by showing that the subject matter of the reference and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person. See MPEP § 706.02(I)(1) and § 706.02(I)(2).

In Example 8 (see also, col.1, lines 6-11), Barclay teaches a chemically amplified positive-acting photoresist composition comprising phenol/styrene/2-methyladamantyl methacrylate terpolymer and di-t-butyl phenyl iodonium camphorsulfonate in the amount of *solid ratio of 4.72*. Barclay spin-coats the photoresist composition onto a silicon wafer and then expose it with a KrF laser. Barclay clearly states (col.13, lines 33-36) that his resists also will be useful for exposure with E-beam exposure, and **extreme UV**

exposure. Based on this teaching, it would have been obvious to use extreme UV to expose Barclay's photoresist-coated silicon wafer in Example 8 with a reasonable expectation of obtaining a high-resolution relief image. The amount of solid ratio of 4.72 for the photoacid generator as taught by Barclay is close enough to the lower end of present range of 5.0 to 15.0 wt% that one skilled in the art would have expected them to have the same properties. Thus, the prior art's teaching of solid ratio of 4.72 would render present range of claim 1 *prima facie* obvious. Where the claimed ranges and prior art do not overlap but are close enough that one skilled in the art would have expected them to have the same properties, a *prima facie* case of obviousness would exist which may be overcome by a showing of unexpected results, In re Titanium Metals Corporation of America v. Banner, supra. For the same reason, the prior art's teaching of solid ratio of 4.72 would render present ranges of claims 7 and 8 *prima facie* obvious. Therefore, Chen's teaching would render obvious present inventions of claims 1, 2, 7, 8, 11, 13, 16-18, 20, and 21.

With respect to present claims 12, 14, and 15, Barclay teaches (col.11, lines 29-50, col.12, lines 19-26) that as his photoacid generator, N-[(perfluorooctanesulfonyl)oxy]-5-norbornene-2,3-dicarboximide (a non-ionic compound) as well as iodonium compounds having anions of perfluorooctanesulfonate or perfluorobutanesulfonate can also be used. Therefore, Barclay's teaching would render obvious present inventions of claims 12, 14, and 15.

Response to Arguments

13. Applicants argue that since Chen only uses 248 nm radiation and relatively low amounts of photoacid generator compound in their working examples, Chen does not anticipate present invention. Applicants also argue that the amount of the photoacid generator as disclosed by Chen does not indicate that such amounts should be used for imaging with EUV radiation.

The Examiner disagrees. Chen states that preferably, his photoacid generator is used in the amount of 0.005 to 10 wt.%, *thus clearly disclosing* the amount "10 wt.%" within his teaching. Thus, it is the Examiner's position that Chen teaches present range of 5.0 to 15.0 wt% (besides, as pointed above, Chen also discloses the use of 5 wt% of photoacid generator in his Example 4). Also, Chen clearly states that his chemically amplified resist system is for use in mid-UV, deep-UV, **extreme UV**, X-ray, and e-beam lithography, and since there are only a few alternatives of light source, one of ordinary skill in the art would immediately envisage exposing Chen's resist coated on the silicon wafer to extreme UV. Finally, there is no indication in Chen that the taught amount of photoacid generator should vary according to the light source. Therefore, it is still the Examiner's position that Chen's teaching anticipates present invention.

Applicants argue that Barclay patent is not sufficient to sustain the instant 102 rejection because it teaches the amount of the photoacid generator to be 4.75 . In view of the amendment which recites "5.0 to 15.0 wt%", the previous 102 rejection over Barclay was replaced with 103 rejection. Thus, applicants' argument is now moot.

Dr. Brainard's Declaration was carefully considered (*in relation to present 103 rejection over Barclay*). However, the declaration does not successfully show

unexpected superior results of present invention over that of Barclay. For example, the declaration does not show that using the present amount (5.0 to 15.0 wt%) of photoacid generator brings unexpected superior results when compared to 4.75 wt.% of Barclay. For another example, the results shown in Table B does not seem to represent good comparison between using EUV imaging and using DUV imaging; for example, for EUV imaging "Esize (mJ/cm²) 100 nm Dense" was measured, whereas for DUV imaging "Esize (mJ/cm²) 150 nm Dense" was measured. Also, no other columns in Table B seem to be comparing the same kind of parameters. That is, For EUV imaging, UFTL and LER were measured, whereas for DUV imaging, side-wall angle, line height, and profile quality were measured.

For the reasons stated above, present rejections over Chen and Barclay still stand.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sin J. Lee whose telephone number is 571-272-1333. The examiner can normally be reached on Monday-Friday from 9:00 am EST to 5:30 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cynthia Kelly, can be reached on 571-272-1526. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR.

Art Unit: 1752

Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

S. Lee

S. Lee

September 16, 2004

Sin J. Lee

Sin J. Lee

Patent Examiner

Technology Center 1700